

Annual Index—Volume 46

LIST OF ISSUES IN VOLUME 46, January 1968 to December 1968

No.	1	January	Pages	1—36
"	2	February		37—68
"	3	March		69—104
"	4	April		105—136
"	5	May		137—172
"	6	June		173—208
"	7	July-August		209—244
"	8	September		245—280
"	9	October		281—316
"	10	November		317—352
"	11	December		353—396

A

- Abbott, H. H.
biographical material 36
Sixty Years of PBX Development 8-16
ACD's See No. 5 Crossbar Automatic Call Distributors
ACRYLONITRILE-BUTADIENE-STYRENE 153
Aging Problems of Plastics (V. T. Wallder) 150-154
ALLENTOWN 96
The Anatomy of IGFET's (R. Edwards) 246-54
Anderson, L. K.
biographical material 352
Holographic Optical Memory For Bulk Data Storage 318-25
ANODIZATION 329
APLYSIA CALIFORNICA 388
ATS-1 SATELLITE 28
AUTOMATIC CALL DISTRIBUTORS
See No. 5 Crossbar Automatic Call Distributors
Automatic Identified Outward Dialing for PBX's: Central Office Facilities (G. A. Backman, R. F. Pina) 112-6
Automatic Intercept Service (W. A. Winckelmann) 138-43
AUTOMATIC MESSAGE ACCOUNTING 354
AUTOMATIC NUMBER IDENTIFICATION 112
AUTOVON 106, 223
AUTOVON: *Switching Network for Global Defense* (J. W. Gorgas) 106-11

B

- Backman, G. A.
biographical material 136
Automatic Identified Outward Dialing for PBX's: Central Office Facilities 112-6
Barbary, G. A.
biographical material, inside back cover, January
Switched Maintenance Access System No. 1A 22-6
BARIUM SODIUM NIOBATE 7, 170, 241
BARIUM STRONTIUM NIOBATE
See Strontium Barium Niobate
BEAM-LEAD CROSSEVERS
See Crossovers
Bell Laboratories at Allentown Observes Anniversary 96-7

- The Bell System and the People Who Built It: The Early Days* (W. H. Doherty) 38-46
The Bell System and the People Who Built It: The Growing Years (W. H. Doherty) 76-83
BELLGRAPH 189
BELLREL 32-3
Berger, U. S.
biographical material 244
TD2: Eighteen Years and Still Growing 210-7
BIREFRINGENCE 4
BIS in the Bell System (G. N. Thayer) 354-61
BIS, BISCUS, BISTSS
See Business Information Systems
Bishop, J. D.
biographical material 172
Terminals and Power for the SF System 155-60
BRAGG DIFFRACTION 325
BUSINESS INFORMATION SYSTEMS 354
Buus, R. G.
biographical material 280
SF Repeaters and Equalizers 267-72

C

- CAPACITORS 330
Carson, D. N.
biographical material 316
The Evolution of PICTUREPHONE Service 282-91
CENTREX SERVICE 332, 377
Centrex Service in No. 1 ESS (W. A. Liss, J. K. McGowan, T. F. Wickham) 332-8
CHEMICAL ANALYSIS 134
Cohen, H. M.
biographical material inside back cover, February
Polycrystalline Magnetic Garnets 55-60
COIN LEVEL DETECTORS 238
COMPANDORS 340
Computer Art Aids Development of Improved Programming Languages 128-9
Computer Generates Thin-Film Circuit Masks (W. Worobey) 144-9
COMPUTER GRAPHICS 71, 128, 180, 189
Computer Graphics in Electrodynamics (E. R. Nagelberg) 70-5
COMPUTER LANGUAGES
See Programming Languages

Annual Index—Volume 46

LIST OF ISSUES IN VOLUME 46, January 1968 to December 1968

No.	1	January	Pages	1—36
"	2	February		37—68
"	3	March		69—104
"	4	April		105—136
"	5	May		137—172
"	6	June		173—208
"	7	July-August		209—244
"	8	September		245—280
"	9	October		281—316
"	10	November		317—352
"	11	December		353—396

A

- Abbott, H. H.
biographical material 36
Sixty Years of PBX Development 8-16
ACD's See No. 5 Crossbar Automatic Call Distributors
ACRYLONITRILE-BUTADIENE-STYRENE 153
Aging Problems of Plastics (V. T. Wallder) 150-154
ALLENTOWN 96
The Anatomy of IGFET's (R. Edwards) 246-54
Anderson, L. K.
biographical material 352
Holographic Optical Memory For Bulk Data Storage 318-25
ANODIZATION 329
APLYSIA CALIFORNICA 388
ATS-1 SATELLITE 28
AUTOMATIC CALL DISTRIBUTORS
See No. 5 Crossbar Automatic Call Distributors
Automatic Identified Outward Dialing for PBX's: Central Office Facilities (G. A. Backman, R. F. Pina) 112-6
Automatic Intercept Service (W. A. Winckelmann) 138-43
AUTOMATIC MESSAGE ACCOUNTING 354
AUTOMATIC NUMBER IDENTIFICATION 112
AUTOVON 106, 223
AUTOVON: *Switching Network for Global Defense* (J. W. Gorgas) 106-11

B

- Backman, G. A.
biographical material 136
Automatic Identified Outward Dialing for PBX's: Central Office Facilities 112-6
Barbary, G. A.
biographical material, inside back cover, January
Switched Maintenance Access System No. 1A 22-6
BARIUM SODIUM NIOBATE 7, 170, 241
BARIUM STRONTIUM NIOBATE
See Strontium Barium Niobate
BEAM-LEAD CROSSEVERS
See Crossovers
Bell Laboratories at Allentown Observes Anniversary 96-7

- The Bell System and the People Who Built It: The Early Days* (W. H. Doherty) 38-46
The Bell System and the People Who Built It: The Growing Years (W. H. Doherty) 76-83
BELLGRAPH 189
BELLREL 32-3
Berger, U. S.
biographical material 244
TD2: Eighteen Years and Still Growing 210-7
BIREFRINGENCE 4
BIS in the Bell System (G. N. Thayer) 354-61
BIS, BISCUS, BISTSS
See Business Information Systems
Bishop, J. D.
biographical material 172
Terminals and Power for the SF System 155-60
BRAGG DIFFRACTION 325
BUSINESS INFORMATION SYSTEMS 354
Buus, R. G.
biographical material 280
SF Repeaters and Equalizers 267-72

C

- CAPACITORS 330
Carson, D. N.
biographical material 316
The Evolution of PICTUREPHONE Service 282-91
CENTREX SERVICE 332, 377
Centrex Service in No. 1 ESS (W. A. Liss, J. K. McGowan, T. F. Wickham) 332-8
CHEMICAL ANALYSIS 134
Cohen, H. M.
biographical material inside back cover, February
Polycrystalline Magnetic Garnets 55-60
COIN LEVEL DETECTORS 238
COMPANDORS 340
Computer Art Aids Development of Improved Programming Languages 128-9
Computer Generates Thin-Film Circuit Masks (W. Worobey) 144-9
COMPUTER GRAPHICS 71, 128, 180, 189
Computer Graphics in Electrodynamics (E. R. Nagelberg) 70-5
COMPUTER LANGUAGES
See Programming Languages

COMPUTER PROGRAMS 255
 COMPUTER STORAGE 318
 Computerized "Instant" Library Loan System Designed 32-3
 COMPUTERS 197, 206, 217, 255
 Computers Take the Tedium Out of Relay Design (W. P. Simon) 255-60
 CONNECTORS 311
 CONSOLES
 See Switching Consoles
 CONTACTS
 See Electrical Contacts
 Continuous Laser Beam Tuned by Bell Labs Scientists 170
 Coping With Visual Distortions (C. S. Harris) 297-304
 COPRECIPITATION X-RAY FLUORESCENCE SPECTROSCOPY 134
 COPREX ANALYSIS
 See Coprecipitation X-Ray Fluorescence Spectroscopy
 CROSSOVERS 64

D

DATA ACQUISITION SYSTEMS 84
 DATA COLLECTING AND REPORTING 197
 DATA MANAGEMENT TECHNIQUES
 See Business Information Systems
 DATAPLUS—A Computer Language for English-Speaking People (N. R. Sinowitz) 362-9
 Death of a Satellite 204-5
 DEMULTIPLEXING 175
 Denton, R. T.
 biographical material 208
 The Laser and PCM 174-9
 Diamond Heat Sinks Improve Semiconductor Device Performance 98
 DICHROMATED GELATIN 276
 DIFFERENTIAL THERMAL ANALYSIS 154
 DIFFRACTION GRATINGS
 See Spectroscopic Diffraction Gratings
 DIGITAL COMMUNICATIONS 84, 277
 DIGITAL DATA RECORDING 84
 DIRECT DISTANCE DIALING 332, 354
 DIRECTORY ASSISTANCE CALLS
 See No. 5 Crossbar Automatic Call Distributor
 Doherty, W. H.
 biographical material 68
 The Bell System and The People Who Built It: The Early Days 38-46
 The Bell System and The People Who Built It: The Growing Years 76-83

E

ECHO I SATELLITE 204
 Edwards R.
 biographical material 280
 The Anatomy of IGFET's 246-54
 ELECTRIC POWER GENERATION
 See Energy Conversion
 ELECTRICAL CONTACTS 228
 ELECTRO-OPTIC EFFECT 3
 ELECTRODYNAMICS
 See Electromagnetics
 ELECTROMAGNETICS 71
 Electron Bunching Discovered In Outer Van Allen Belt 28-9
 ELECTRON MICROSCOPY 102
 ELECTRONIC SWITCHING 311, 332
 ELECTRONIC TELEPHONES 130
 Electron's Hidden Momentum Explained by Shockley 99
 Elek, J. W.
 biographical material 244
 Mask-Making and Computers 217-21

Elliott, G. L.
 biographical material 390
 No. 5 Crossbar Automatic Call Distributor 370-6
 ENCAPSULATION
 See Packaging
 ENERGY CONVERSION 17
 Entire Newspaper Page Facsimile Sent via Telephone Data Link 277
 ENVIRONMENTAL STRESS-CRACKING 154
 Epstein, B. M.
 biographical material 104
 A New PCM Data Acquisition System 84-8
 EQUALIZERS 267
 ESS
 See Electronic Switching
 The Evolution of PICTUREPHONE Service (D. N. Carson) 282-91
 Expanding Centrex Services (R. W. Kahn) 377-82
 Experimental Device May Extend Use of Touch-Tone Telephone to the Deaf 34
 Experimental Electronic Telephone Revealed 130-1

F

Fast Way Found to Analyze Trace Elements in Materials 134
 FERRIMAGNETISM 56, 57
 FERRITES 55
 FET's 247
 FIELD-EFFECT TRANSISTORS
 See FET's
 Flat Holograms Show 360° View of Object 100-101
 40 & 20 Years Ago in the RECORD 35, 67, 103, 135, 171, 207, 242-3, 278, 314, 350, 388
 FUEL CELLS 18, 20

G

GALLIUM PHOSPHIDE 91
 Galt, J. K.
 biographical material 104
 Luminescence in Semiconductors 89-94
 GARNETS
 See Magnetic Garnets
 GAS ANALYSIS 168
 GERMANIUM 346
 GLANCE 187, 189
 GOLD BEAM-LEAD CROSSOVERS 64
 Gorgas, J. W.
 biographical material 136, inside back cover, July/August
 AUTOVON Switching Network for Global Defense 106-11
 The Polygrid Network for AUTOVON 222-7
 Gould, E. P.
 biographical material 208
 TELPORT — Time-Shared Information Systems 197-202
 GRAPHICS 2 187, 189
 The Growth of Computer Graphics at Bell Laboratories (W. H. Ninke) 180-8

H

HALFWAVE RETARDATION VOLTAGE 5
 Hamilton, B. H.
 biographical material 36
 A Look at New Methods of Energy Conversion 17-21
 Haner, R. L.
 biographical material 316, inside back cover, November
 Improvements to N1 and ON Carrier 292-6
 A New Interface Between N3 and L Systems 339-44
 HARMONIC GENERATORS 3, 241

Harris, C. S.
 biographical material 316
Coping With Visual Distortions 297-304
 HEARING 261
 HEARING AIDS 34
 HEAT SINKS 98
 Henderson, D. M.
 biographical material 280
SF Repeaters and Equalizers 267-72
Highest Laser Frequency Measurement Is Also Most Accurate 66
 HOLOGRAPHIC INTERFEROMETRY 386
Holographic Optical Memory For Bulk Data Storage (L. K. Anderson) 318-25
 HOLOGRAPHY 100, 274, 276, 318, 386
Holography Used in Testing Metals 386
 Howland, F. L.
 biographical material 244
Mask-Making and Computers 217-21

I

IDENTIFIED OUTWARD DIALING 112
 IGFET's 247
IMPATT Diodes Connected in Series for Increased Power 99
Improvements to N1 and ON Carrier (R. L. Haner, G. A. Roe) 292-6
 INFORMATION SYSTEMS 197
Information Theory (J. R. Pierce) 47-51
 INFRARED RADIATION DETECTORS 386
 INFRARED SPECTROSCOPY 168
 INSULATED-GATE FIELD-EFFECT TRANSISTORS
 See IGFET's
 INTEGRATED CIRCUITS 64, 144, 166, 217, 327
Interactive Computer Graphics (P. S. Kopel) 189-96
 INTERNAL REFLECTION SPECTROSCOPY 153

J

JFET's 247
 JUNCTION EQUIPMENT 340
 JUNCTION FIELD-EFFECT TRANSISTORS
 See JFET's

K

Kahn, R. W.
 biographical material 390
Expanding Centrex Services 377-82
 Kassig, J. J.
 biographical material inside back cover, September
SF Repeaters and Equalizers 267-72
 Keith, W. H.
 biographical material 136
A New Switching System for "Right-of-Way" Companies 117-20
 KINESTHESIS 299
 Kopel, P. S.
 biographical material 208
Interactive Computer Graphics 189-96

L

L COAXIAL CARRIER 339
 LASER FREQUENCY MEASUREMENTS 66
The Laser and PCM (R. T. Denton) 174-9
 LASERS 3, 66, 170, 175, 241, 318, 387,
Lasers Chart Snail's Nerve Roots 387
 Laudise, R. A.
 biographical materials 36
The Search for Nonlinear Optical Materials for Laser Communications 2-7
Layers of Carbon Atoms Photographed 102
 L-4 COAXIAL CABLE SYSTEM 121

LIBRARY LOAN SYSTEMS

See BELLREL
 LIGHT PEN 186
 Liss, W. A.
 biographical material 352
Centrex Service in No. 1 ESS 332-8
 LITHIUM NIOBATE 6
 LITHIUM TANTALATE 7
"Live" X-Ray Made With PICTUREPHONE Camera Tube 310
A Look at New Methods of Energy Conversion (B. H. Hamilton, T. J. Plevyak) 17-21
Low-Density Tantalum (B. H. Vromen) 326-31
Luminescence in Semiconductors (D. G. Thomas, J. K. Galt) 89-94
 Lummis, R. C.
 biographical material 280
The Secret Code of Hearing 261-6

M

MAGNETIC GARNETS 55
 MAGNETIC MATERIALS 240
 MAGNETOHYDRODYNAMIC GENERATORS
 See MHD Generators
The Making of a Good Contact (H. N. Wagar) 228-234
 MASK MAKING 144, 217
Mask-Making and Computers (F. L. Howland, J. W. Elek) 217-221
 MATRIX ISOLATION
 See Pseudo-Matrix Isolation
 May, H. F.
 biographical material 390
No. 5 Crossbar Automatic Call Distributor 370-6
 McGowan, J. K.
 biographical material 352
Centrex Service in No. 1 ESS 332-8
 MEMORIES
 See Computer Storage
 METALLURGY 386
 MHD GENERATORS 18, 21
 MICROFILM RECORDERS 187
 MICROWAVE COMMUNICATIONS 348
Microwaves Might be Answer to Tunnel Communications 348-9
 MILITARY COMMUNICATIONS
 See AUTOVON
 MOBILE COMMUNICATIONS 348
 MOD II 291
 MODULATION 3
 Molloy, P. E.
 biographical material 390
No. 5 Crossbar Automatic Call Distributor 370-6
A Monolithic Crystal Filter (R. A. Sykes, W. L. Smith) 52-4
 Mosior, J. W.
 biographical material inside back cover, June
TELPOR — Time-Shared Information Systems 197-202
 MULTIPLE INTERNAL REFLECTION SPECTROSCOPY
 See Internal Reflection Spectroscopy
 MULTIPLEXING 175

N

Nagelberg, E. R.
 biographical material 104
Computer Graphics in Electrodynamics 70-5
Negative Impedance Boosting Takes a Practical Turn 236-7
 NEUROPHYSIOLOGY 387
New Coin Level Detector for Coin Telephones 238-9
New Connectors Plug in ESS Frames for Fast Installation and Easy Growth 311-3
New Device for Checking Semiconductor Wafers 384

New Gold Crossovers Interconnect Integrated Circuits 64-5
 New Holographic Plate Material Introduced 276
 A New Interface Between N3 and L Systems (R. L. Haner, T. H. Simmonds, L. H. Steiff) 339-44
 A New PCM Data Acquisition System (B. M. Epstein) 84-8
 New Permanent Magnet Materials Discovered 240-1
 New Protection for Telephone Receivers 346-7
 A New Switching System for "Right-of-Way" Companies (W. H. Keith) 117-20
 New Techniques Permit Almost a Million Components per Square Inch 166-7
 New Telephone Wire Plow Reduces Costs of Buried Construction 30-1
 New Test Set For Measuring Circuit Noise 132-3
 NIB
 See Negative Impedance Boosting
 Ninke, W. H.
 biographical material 208
 The Growth of Computer Graphics at Bell Laboratories 180-8
 NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY 205
 NMR Used to Study Optically Excited Molecules 205
 No. 5 Crossbar Automatic Call Distributor (P. E. Molloy, G. L. Elliott, H. F. May) 370-6
 NONLINEAR OPTICAL MATERIALS 3
 N1 CARRIER 292
 N3 CARRIER 339
 N3-L JUNCTION 339

O

ON CARRIER 292
 OPTICAL COMMUNICATION SYSTEMS 175
 OPTICAL DAMAGE 7
 OPTICAL DISTORTIONS 297

P

PACKAGING 305
 PARAMETRIC DEVICES 3
 PARAMETRIC OSCILLATORS 170
 PBX's 9, 112, 117, 332
 PCM DATA ACQUISITION SYSTEMS 84
 PERMANENT MAGNETS 240
 PHASE MATCHING 170
 PHOTOGRAPHY 102
 PHOTOMASKS 144
 PIC CABLE 305
 PICTUREPHONE SERVICE 206, 282, 310, 385
 PICTUREPHONE® Sets Put a Computer on Executive Desks 206
 Pierce, J. R.
 biographical material 68
 Information Theory 47-51
 Plevyak, T. J.
 biographical material 36
 A Look at New Methods of Energy Conversion 17-21
 Pina, R. F.
 biographical material 136
 Automatic Identified Outward Dialing for PBX's: Central Office Facilities 112-6
 PLASTICS 150, 305
 PLOWSHARES 30
 PLUGGING MATERIALS 305
 PMI SPECTROSCOPY
 See Pseudo-Matrix Isolation
 POLARIZABILITY 5
 Polycrystalline Magnetic Garnets (H. M. Cohen) 55-60
 POLYETHYLENE 150
 The Polygrid Network for AUTOVON (J. W. Gorgas) 222-7
 Polyurethane Goes Underground (J. L. Williams) 305-8

Power and Conversion Efficiency Increased in Solid-State Source of Coherent Green Light 241
 Power for the L-4 Repeaters (E. Sesso, P. P. Untamo) 121-6
 POWER SUPPLIES 121, 155
 PRESSURE PLUGS
 See Plugging Materials
 PROGRAMMING LANGUAGES 362
 PSEUDO-MATRIX ISOLATION 168
 PULSE CODE MODULATION 84, 175, 385
 PULSE TRANSMISSION SYSTEMS 277
 PYROELECTRIC DETECTORS 386

R

Radio Noise May Limit Van Allen Radiation 62-3
 RADIO RELAY SYSTEMS 210
 RELAYS 255
 REPEATERS 121, 267
 RESISTORS 330
 Roe, G. A.
 biographical material 316
 Improvements to N1 and ON Carrier 292-6

S

SATELLITE COMMUNICATIONS 204
 SBN
 See Strontium Barium Nitrate
 The Search for Nonlinear Optical Materials for Laser Communications (R. A. Laudise) 2-7
 The Secret Code of Hearing (R. C. Lummis) 261-6
 SEMICONDUCTOR DEVICES 98, 247, 346
 SEMICONDUCTORS (MATERIALS) 89, 91, 346
 Sesso, E.
 biographical material 136
 Power for the L-4 Repeaters 121-6
 SF Repeaters and Equalizers (R. G. Buus, D. M. Henderson, J. J. Kassig) 267-72
 SF SUBMARINE CABLE SYSTEM 155, 267
 Simmonds, T. H.
 biographical material inside back cover, November
 A New Interface between N3 and L Systems 339-44
 Simon, W. P.
 biographical material 280
 Computers Take the Tedium Out of Relay Design 255-60
 Sinowitz, N. R.
 biographical material 390
 DATAPLUS—A Computer Language for English-Speaking People 362-9
 Sixty Years of PBX Development (H. H. Abbott) 8-16
 Smith, W. L.
 biographical material inside back cover, February
 A Monolithic Crystal Filter 52-4
 SOLAR CELLS 18, 19
 SPECTROCHEMICAL ANALYSIS 134
 SPECTROSCOPIC DIFFRACTION GRATINGS 276
 STARE 187, 189
 Steiff, L. H.
 biographical material, inside back cover, November
 A New Interface Between N3 and L Systems 339-44
 Stop-Action Holography 274-5
 STRONTIUM BARIUM NIOBATE 2, 386
 SUBMARINE CABLE SYSTEMS
 See SF Submarine Cable Systems
 Sun Aids Transmission Study 161-4
 Switched Maintenance Access System No. 1A (G. A. Barbary) 22-6
 SWITCHING CONSOLES 333
 SWITCHING SYSTEMS 106, 117, 223
 Sykes, R. A.
 biographical material, inside back cover, February
 A Monolithic Crystal Filter 52-4

T

- TANTALUM 327
 TD2: *Eighteen Years and Still Growing* (U. S. Berger) 210-17
 Technique Developed for Simple Rapid Analysis of Gas Mixtures 168-9
 TELEPHONE INSTRUMENTS 130, 346
 TELPORT—Time-Shared Information Systems (E. P. Gould, J. W. Mosior) 197-202
 Terminals and Power for the SF System (J. D. Bishop, J. L. Thomas, C. A. von Roesgen) 155-160
 Thayer, G. N.
 biographical material 390
 BIS in the Bell System 354-61
 THERMIONIC GENERATORS 18, 21
 THERMOELECTRIC GENERATORS 18, 19
 Thomas, D. G.
 biographical material 104
 Luminescence in Semiconductors 89-94
 Thomas, J. L.
 biographical material inside back cover, May
 Terminals and Power for the SF System 155-60
 TIME SHARING 197
 T-1 CARRIER SYSTEM 277
 TOUCH-TONE® TELEPHONES 34, 206
 TRANSMISSION OF RADIO WAVES 161
 TRANSMISSION TESTS 132
 TUNING 170

U

- Untamo, P. P.
 biographical material, inside back cover, April
 Power for the L-4 Repeaters 121-6

V

- VAN ALLEN BELT 28, 62
 VARIABLE PARAMETER OSCILLATORS 170
 VARISTORS 346
 VIDEO EDITING TECHNIQUE 385
 VIDEOTELEPHONES 385

VISION 297

- VOCODERS 51
 von Roesgen, C. A.
 biographical material inside back cover, May
 Terminals and Power for the SF System 155-60
 Vromen, B. H.
 biographical material 352
 Low-Density Tantalum 326-31

W

- Wagar, H. N.
 biographical material, inside back cover, July/
 August
 The Making of a Good Contact 228-34
 Wallder, V. T.
 biographical material 172
 Aging Problems of Plastics 150-4
 Wickham, T. F.
 biographical material, inside back cover, November
 Centrex Service in No. 1 ESS 332-8
 Williams, J. L.
 biographical material, inside back cover, October
 Polyurethane Goes Underground 305-8
 Winckelmann, W. A.
 biographical material 172
 Automatic Intercept Service 138-43
 WIRE PLOWS
 See Plowshares
 Worobey, W.
 biographical material 172
 Computer Generates Thin-Film Circuit Masks 144-9

X

- X-RAY DIFFRACTION 310

Y

- YAG LASERS 170, 179, 241
 YTTRIUM IRON GARNETS 56, 57

